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RPPR Final Report
as of 07-Feb-2018

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INVESTIGATOR(S):

Name: Chung King Law
Email: cklaw@princeton.edu
Phone Number: 6092585271
Principal: Y

Organization: **Princeton University**

Address: PO Box 36, Princeton, NJ 085442020

Country: USA

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Final Report for Period Beginning 17-Mar-2017 and Ending 16-Sep-2017

Title: Conference/Symposium: 2017 Princeton-CI Summer School on Combustion

Begin Performance Period: 17-Mar-2017

End Performance Period: 16-Sep-2017

Report Term: 0-Other

Submitted By: Abhishek Saha

Email: asaha@princeton.edu

Phone: (609) 258-4083

Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees:

STEM Participants:

Major Goals: To provide the next generation of combustion researchers with a comprehensive knowledge in the technical areas of combustion theory, experiment, computation, fundamentals, and applications.

Accomplishments: Details are provided in the report attached separately.

Training Opportunities: 181 participants, including graduate students, post-docs, research staffs from us and non-us educational institutes, national labs and industries have attended the summer school. Participants lived in the same dormitory complex, in air-conditioned rooms as the sessions were held in the summer, and had meals in the dining hall together. The instructors were not only among the best researchers in combustion, internationally, but were also known to be great lecturers. All lectures were videotaped for free access by the general public on our web-site and on YouTube.

Details are provided in the report attached separately.

Results Dissemination: Nothing to Report

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: PD/PI

Participant: Chung K. Law

Person Months Worked: 1.00

Funding Support:

Project Contribution:

International Collaboration:

International Travel:

National Academy Member: Y

Other Collaborators:

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Report on the

2017 Princeton-Combustion Institute Summer School on Combustion



Submitted by Chung K. Law
Principal Organizer, and
Robert H. Goddard Professor, Princeton University
January, 2018

ACKNOWLEDGEMENT

The 2017 Princeton-Combustion Institute Summer School on Combustion was conducted at Princeton University and attended by 181 US and international graduate students and researchers. Five 15-hour lectures on aspects of foundational and technical combustion were delivered by five world-renowned researchers (M. Matalon, W. Green, A. Dreizler, S. Klippenstein, Y. Ju, G. Richards and T. Lu) who are also recognized as master lecturers. This Summer School was sponsored by the Combustion Institute, and Princeton University, with additional funding support from the US Army Research Office, the US National Science Foundation, and the King Abdullah University of Science and Technology (KAUST). On behalf of all the attendees, the organizers of the Summer School express their profound gratitude to the lecturers, sponsors and supporters for their participation in and contributions to this well-attended and much-needed annual event, which has become an integral educational and outreach activity of the global combustion enterprise. The following is a summary of the program, images of the event, feedbacks from the participants and thoughts of the organizers.

PROGRAM AND SCHEDULE

2017 Princeton-Combustion Institute Summer School on Combustion - Schedule of Events

Sunday, June 25th

13:00 – 17:00 Check In (Butler College)
15:00 – 17:30 Combustion Lab Tours*
18:30 – 20:30 Welcome Dinner/BBQ (Lawn of Butler College)

Monday, June 26th – Friday, June 30th (see schedule below for special events)

08:45 – 09:45 Morning Lectures
09:45 – 10:00 Break[#]
10:00 – 11:00 Morning Lectures Continues
11:00 – 11:15 Break[#]
11:15 – 12:15 Morning Lectures Continues
12:15 – 14:00 Lunch Break (Tiger Inn Eating Club**)
14:00 – 15:00 Afternoon Lectures
15:00 – 15:15 Break[#]
15:15 – 16:15 Afternoon Lectures Continues
16:15 – 16:30 Break[#]
16:30 – 17:30 Afternoon Lectures Continues
17:30 Adjourn for the day

Visit the poster-room during the breaks. Poster presenters are encouraged to leave their contact information on the posters, so that they can be contacted by the interested parties to discuss/schedule meetings during the breaks.

Friday, June 30th

08:45 – 17:30 Check Out (Friend Center)

Lecture Schedule:

Mon 6/26	Tue 6/27	Wed 6/28	Thur 6/29	Fri 6/30
Morning Lectures: 08:45 – 12:15				
Combustion and Fuels Chemistry and Kinetics (Mon-Fri) - Prof. William H. Green, , Friend Center 101				
Advanced Laser Diagnostics in Turbulent Combustion (Mon-Fri) - Prof. Andreas Dreizler, Comp Sci Bldg 104				
Afternoon Lectures: 14:00–17:30				
Combustion Theory (Mon-Fri) - Prof. Moshe Matalon, Friend Center101				
Advanced Combustion Chemistry – Dr. Stephen J. Klippenstein (Mon-Wed) and Prof. Tianfeng Lu (Thu-Fri), Comp Sci Bldg 104				
Frontiers in Combustion Technologies - Prof. Yiguang Ju (Mon-Wed) and Dr. George A. Richards (Thu-Fri), Friend Center 006				

Special Events Schedule:

Sun 6/25	Mon 6/26	Tue 6/27	Wed 6/28	Thur 6/29	Fri 6/30
Welcome BBQ - Lawn of Butler College (in case of rain, Whitman College Dining Hall) 18:30-20:30	Poster Session- 19:45 – 21:00 Friend Center Convocation Room (Posters will be in display until Friday Morning)	Career Panel (Lunch Event) 12:45-13:45	Group Picture 12:15-12:45 (You must wear your Summer School T-Shirt to be included in the photo)	Celebration and Farewell Dinner – Frick Chemistry Building 18:00-20:00	Program Adjourns 17:30

* Combustion Lab Tours are only for pre-enrolled participants.

During breaks, coffee and tea would be available at the convocation room (poster room).

Dining Hall Hours: Breakfast: 07:00-08:30 (Wilcox Dining Hall, adjacent to Butler dorm); Lunch: 12:15 – 14:00 (Tiger Inn, Student Eating Club),
Dinner: 17:30 – 19:30 (Tiger Inn, Student Eating Club)

Emergencies - Dial 911 (Call 609-258-3333 from your cell phone for on-campus emergencies) Princeton University Public Safety - (609) 258-1000 (non-emergencies)

GEOGRAPHICAL BREAKDOWN OF ATTENDEES

<u>Country of Affiliation</u>	<u>No. of Participants</u>	<u>Continent of Affiliation</u>	<u>No. of Participants</u>
Kuwait	1	Asia	17
Saudi Arabia	15		
United Arab Emirates	1		
France	1	Europe	10
Italy	3		
Norway	1		
Romania	1		
Turkey	1		
United Kingdom	3		
Canada	1	North America	153
USA	152		
Brazil	1	South America	1
Total	181		181

IMAGES



Group Portrait: A Magnificent Sea of Purple!



Farewell Banquet



Poster Session



Discussions Following the Lectures

FEEDBACKS AND SUGGESTIONS

Sample Feedbacks from Participants

At the conclusion of the session, participants were asked to provide their feedback and suggestions for further improvements. The following are representative of the overall very positive feedbacks that were received.

- “I have no words to describe how grateful I am having such experience at Princeton University Summer 2017. Starting from the ride I had the honor to have from a distinguished professor like you to the check-in point, to the moment I checked out, I have been really impressed by the great hospitality and the sincere spirit to have all of us gaining the combustion science from great and generous professors.

Personally, I want to thank you, Professor Law, and express my gratitude for the tremendous arrangement, great munificence, and the new experience we gained because of you.”

Samy A. Alkhayat (PhD student, Wayne State Univ.)

- “...The lecturers were great, the food was good and in ample quantities, the accommodations had AC (though the weather was so pleasant we hardly needed it), and every event/lecture ran efficiently and on-time....”

Alan Long (PhD student, MIT)

- “I wanted to extend my sincerest thank you for taking the time to organize and develop the Combustion Summer School at Princeton this past week. The lecturers were absolutely amazing world class teachers and I am honored to have learned from them. Being a fairly new graduate student in a brand new lab it was very interesting to see how my research will tie into the big picture of the combustion community. The program got me even more excited about the work I'm currently doing. I have no complaints about any of the facilities that were provided during my stay at Princeton. It was sometimes difficult to follow along with the lectures when they changed their slides or slide order, but that is something that can hardly be foreseen. You did a wonderful job providing us with the most updated lecture slides. It was an absolute pleasure, and I look forward to next year's program. Thank you again.”

Jacob Davis (University of Georgia)

- ” After my fourth Combustion Summer School in as many years, with three of those at Princeton, I finally feel prepared to submit some comments and feedback.....I would first like to thank you for this and past editions of the summer school and for being a driving force in the development of these programs. I imagine that without the establishment of the Princeton-CEFRC programs, the TU Darmstadt summer school I attended last year (and others) might never have simply come to be or would have been delayed in their

implementation...This year's lecturers were excellent. As I presently am a member of a research group (Prof. Goldsmith, Brown) that does work in electronic structure theory, I have had some exposure to the material covered by Dr. Klippenstein. My own work is experimental in nature, so I am not at all an expert in theory, nor am I required to be. The opportunity, however, to hear it directly from him in an organized and coherent format greatly improved my knowledge and understanding of this work and should allow me to far more effectively collaborate with theorists...I also greatly enjoyed Prof. Dreizler's course. I was motivated to attend this year's summer school in no small part based upon how impressed I was with the program he offered last summer. The laser diagnostics I employ in my current work in shock tube diagnostics are far simpler than his; the laser diagnostics course presented me with a thorough overview of possibilities for future applications and insight into the work carried out by a larger research community...Regarding Prof. Lu's courses, I intend to utilize his slides as a future reference. The lectures were well-structured and organized and provided me with all new information. ..

The inclusion of posters this year was a welcome addition to the program that provided significant opportunities for networking and interaction above and beyond those in past years. In particular, I found the use of a common break room also containing the posters to be an excellent choice. These daytime (and lunchtime) interactions were extremely productive. With the amount of time available and the number of conversations in which I participated, I found the Monday evening poster session to actually be unnecessary. As a poster presenter, attendance on Monday evening seemed to be lacking and seemed to have the unintentional effect on Monday of isolating presenters from other participants who were engaging in other social activities that evening.

Finally, I have consistently found the social program at the Princeton Summer School to be lacking. Some list of recommended activities or social venues nearby could be included in course materials.

M. Fuller (PhD student, Brown Univ.)

Suggestions from Participants

The common suggestion by the participants is noted below, and will be considered in the formulation for the programs in subsequent sessions.

Outside Class room Social Activity: The participants have requested for outside classroom social activities through which they can mingle and network even better. Due to time constraints, it is difficult to organize such events. But the organizers would pay keen attention in the next year's edition of summer school, if we can enhance their experience.

Program Organizers' Experience

This year's program was attended by 181 participants, which is at par with the attendance over last few summer schools except 2016, where we experienced a large increase in application. This sustained participation is a clear indicator of the robustness of the discipline. Luckily in Princeton, we have facilities available for accommodation and dining of such a large group of people.

Since 2016, we have introduced a poster session to our program. While in 2016 it was only limited to a 3 hour session, this year (2017) we have expanded it to a week-long event by keeping the posters available to all during the coffee and lunch breaks. We have experienced a much improved and engaging discussions among the participants which were not limited by time anymore. The participants also appreciated the ample opportunity to discuss and network through the posters.

Finally, as organizers, perhaps the most precious reward is to see the students come, enjoy and learn from this one-week experience, and bring it back to their own research environments as a continuing source of knowledge and inspiration. Just like the lecturers, the organizers derive immense pleasure and satisfaction in facilitating the education, networking and collaboration elements of the combustion enterprise.